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KWON et al.(10) **Pub. No.: US 2008/0186148 A1**(43) **Pub. Date: Aug. 7, 2008**(54) **BUILDING MANAGEMENT SYSTEM AND ITS OPERATION CONTROL METHOD**(30) **Foreign Application Priority Data**

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RESTON, VA 20191(57) **ABSTRACT**

A building management system controls an operation of a system related to state information provided from multiple systems within the building management system among the multiple systems. Because the building management system is operated to control the multiple systems in an interworking manner, the operation efficiency of the building management system can be improved.

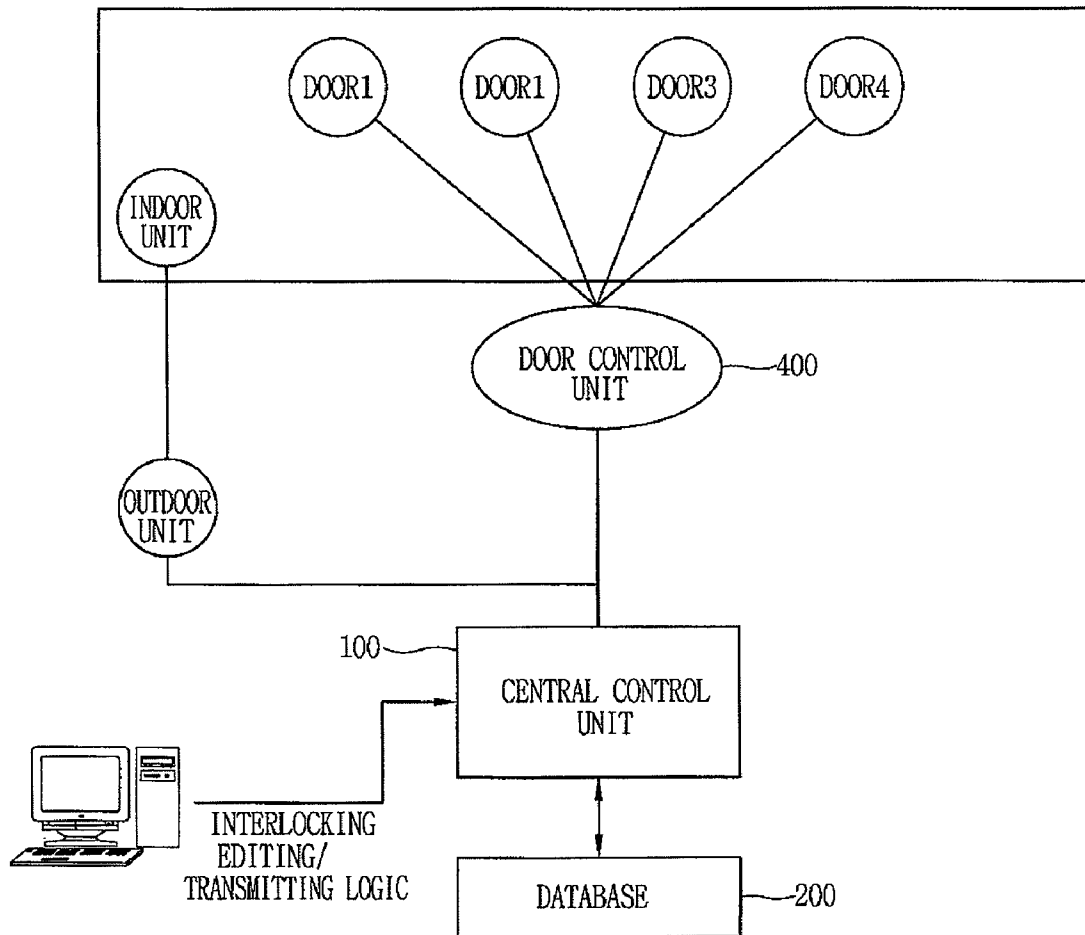
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Fig 1.

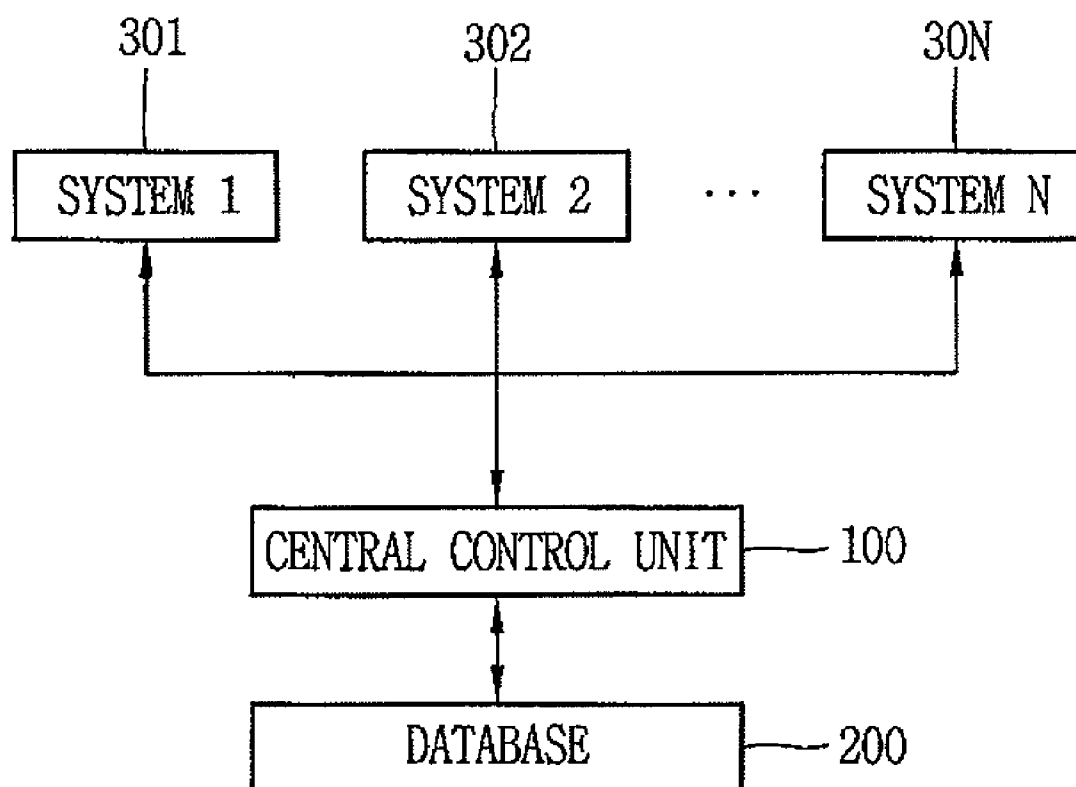


Fig 2.

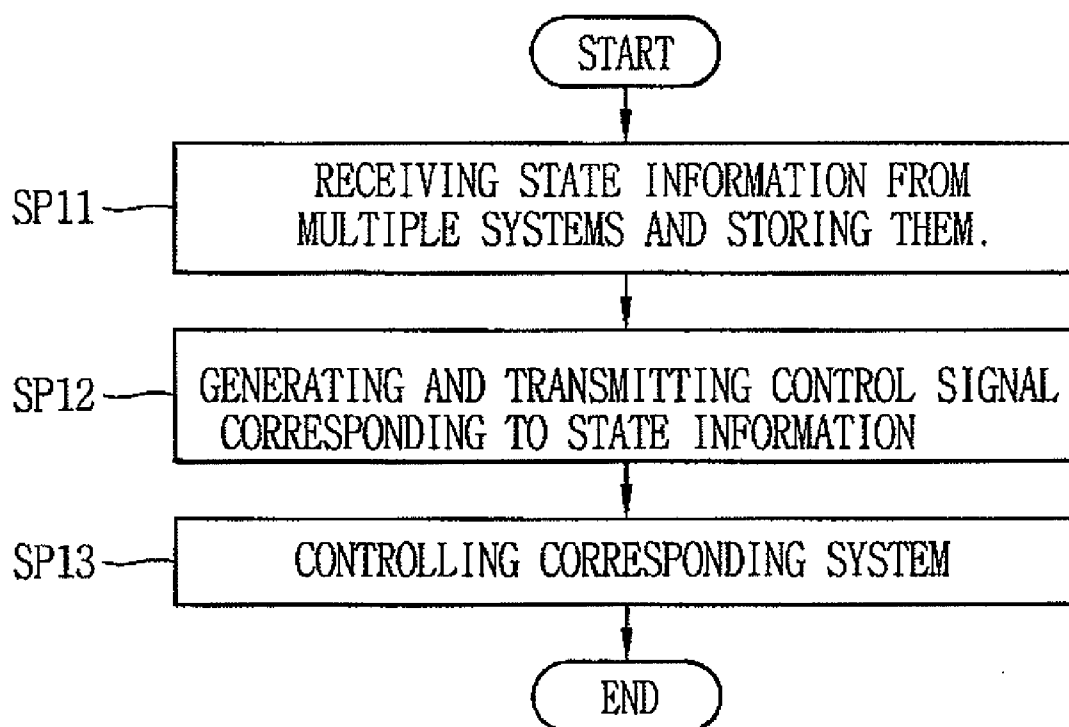


Fig 3.

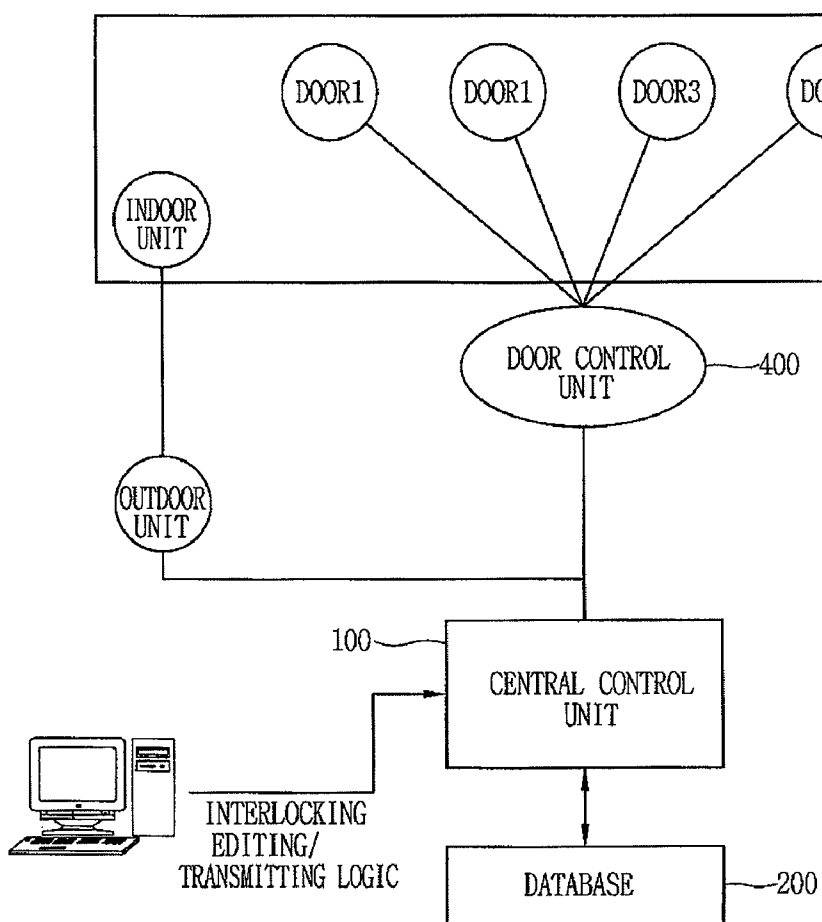


Fig 4.

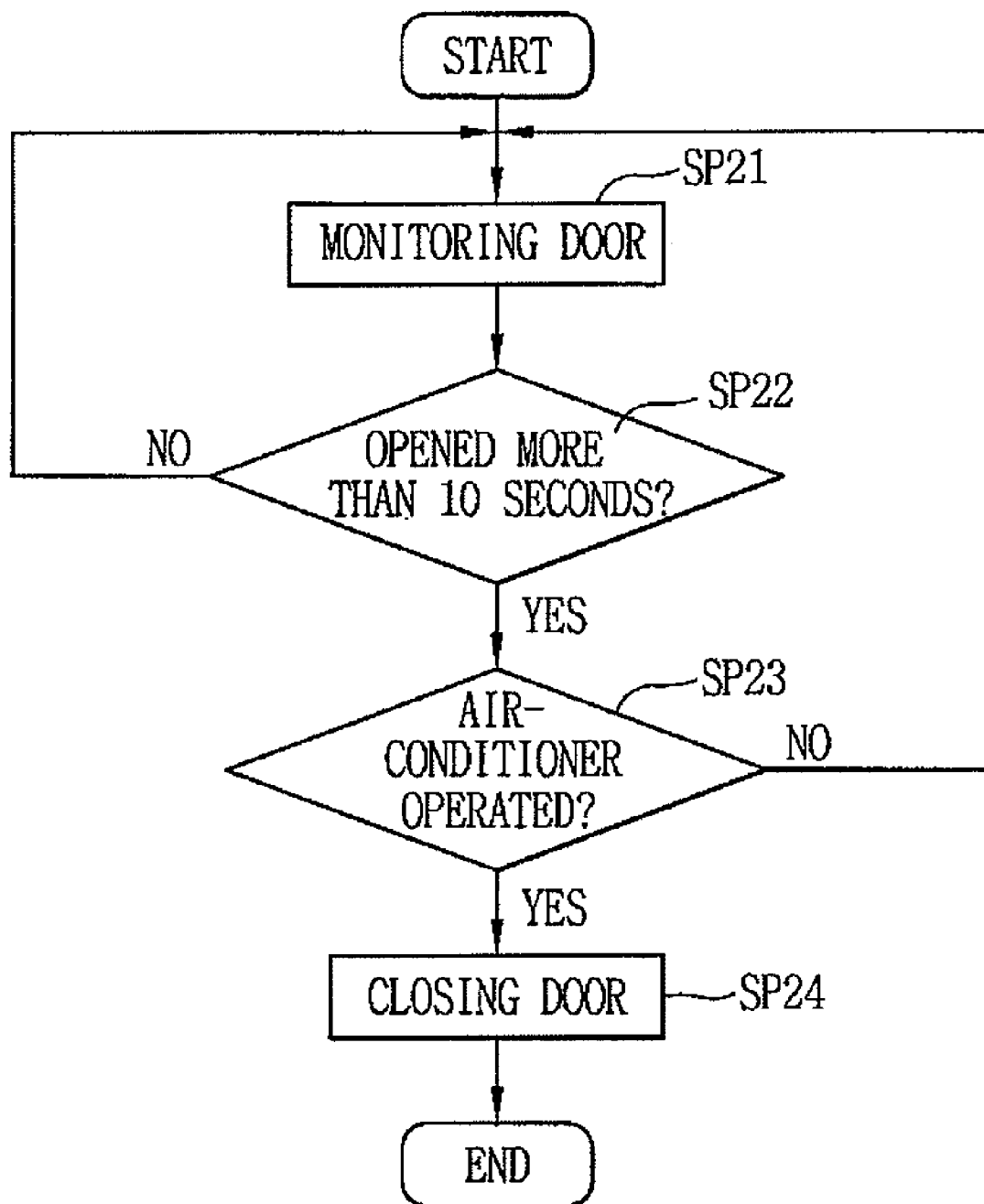


Fig 5.

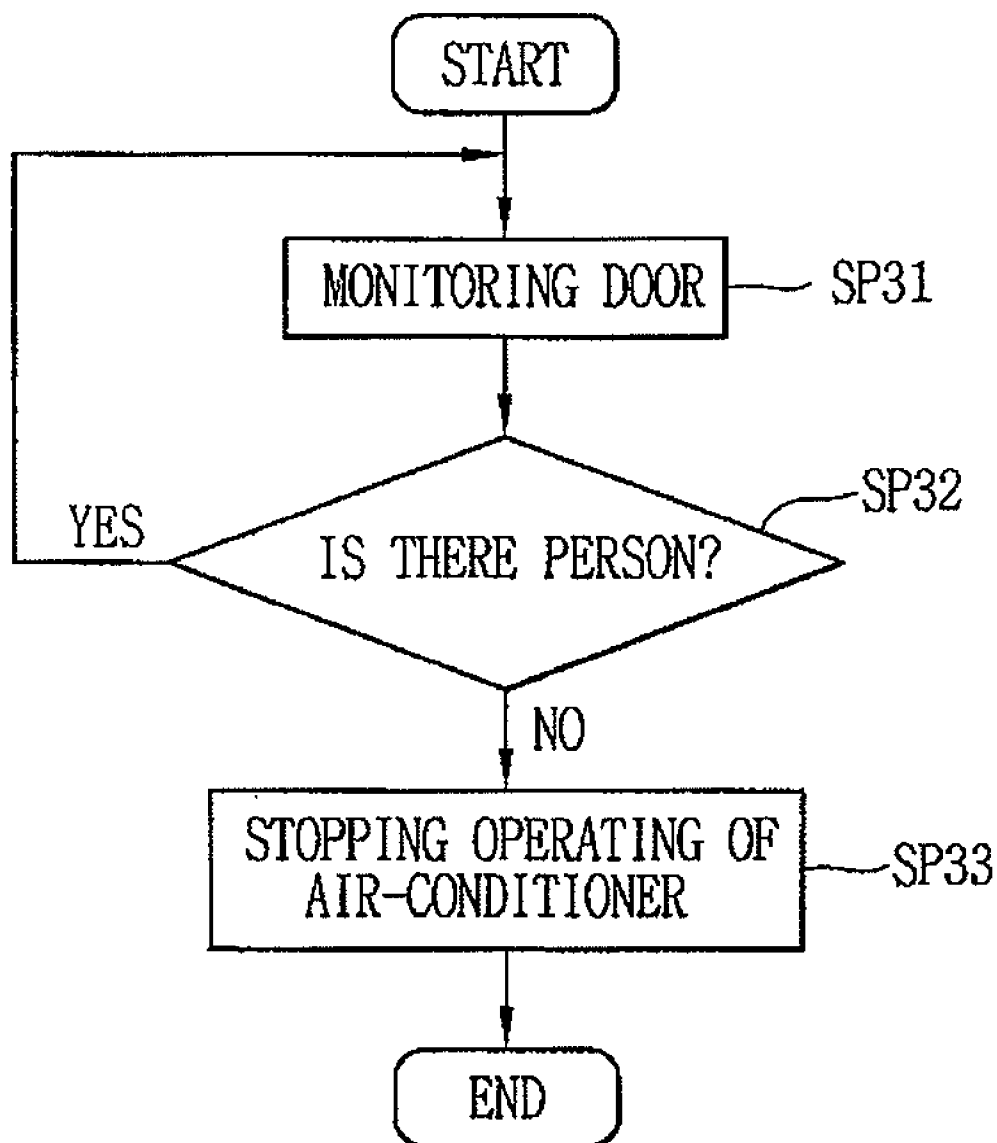
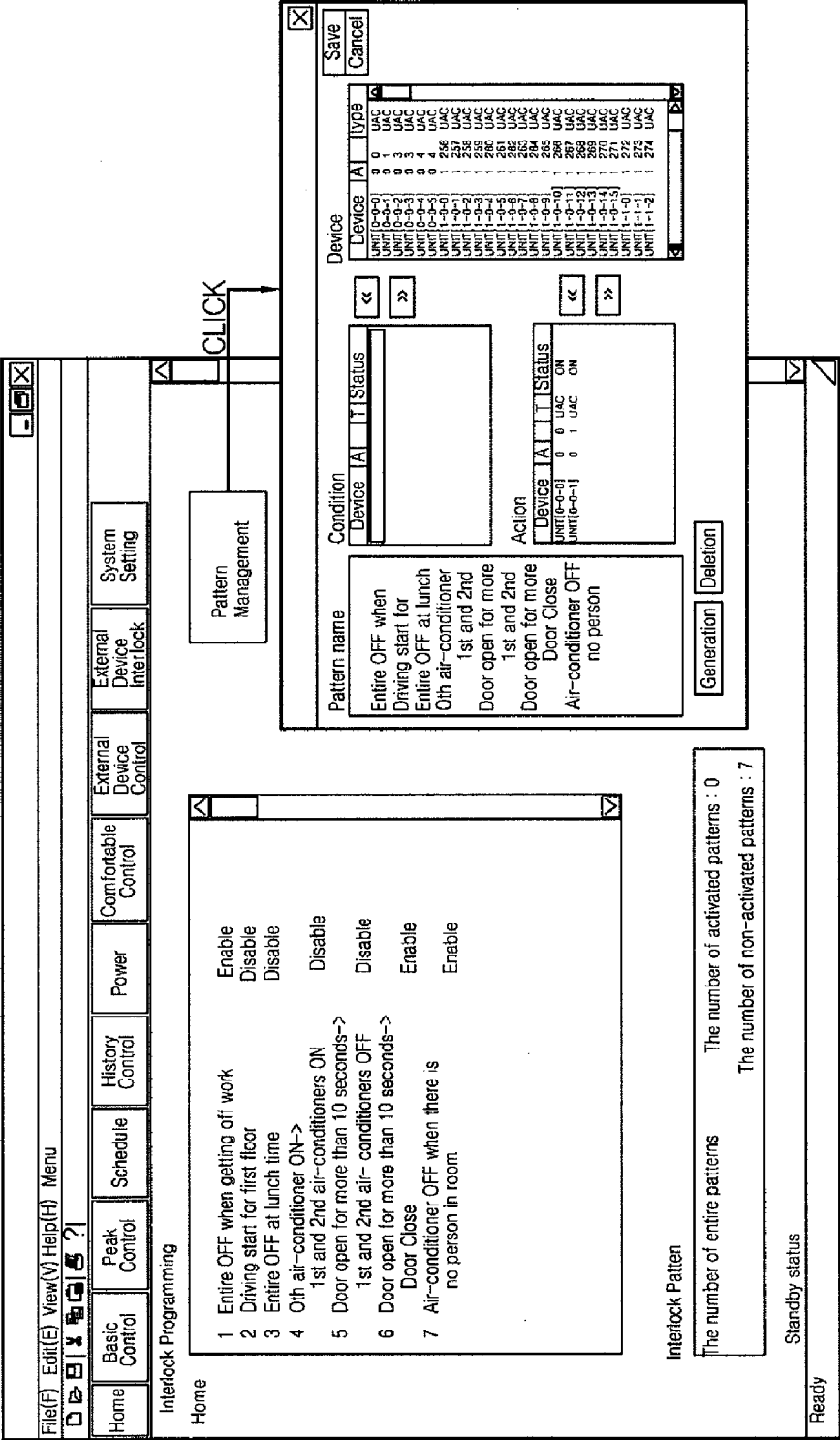


FIGURE 6.



BUILDING MANAGEMENT SYSTEM AND ITS OPERATION CONTROL METHOD

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a building management system and, more particularly, to a building management system and its operation control method capable of integrally or collectively controlling operations of multiple systems based on state information of the multiple systems accommodated in a building.

[0003] 2. Description of the Related Art

[0004] Recently, as the facilities of buildings are being modernized, an automatic control system for automatically controlling sub-systems such as a power management, illumination, air-conditioning, disaster prevention and security management equipment installed in buildings is increasingly used, and a building management system that can integrally (collectively) manage the sub-systems is being actively developed.

[0005] However, with respect to multiple systems located in a building, the related art building management system independently controls and monitors each operation of each system that includes respective state information.

[0006] Thus, the related art building management system has a problem in that it cannot control different systems according to the state of a particular system, resulting in a failure of effectively managing various systems accommodated in the building.

[0007] For example, if a door is open while an air-conditioner system performs an air cooling operation or an air heating operation, cool air or heated air would be externally discharged to unnecessarily consume energy, or if there is no person in a room while the air-conditioner system performs an air cooling operation or an air heating operation, energy would be also unnecessarily consumed.

SUMMARY OF THE INVENTION

[0008] Therefore, in order to address the above matters, the various features described herein have been conceived. One aspect of the exemplary embodiments is to provide a building management system capable of controlling multiple systems in 10 an interworking manner based on state information of each of the multiple system included in the building management system, thereby effectively managing a building, and its operation control method.

[0009] This specification provides a building management system that may include: a central control unit that receives state information from a first system of a building and controls an operation of a second system of the building based on the state information.

[0010] This specification also provides a method of controlling a system of a building, that may include: receiving state information from a first system of the building; and controlling an operation of a second system of the building based on the state information.

[0011] The foregoing and other objects, features, aspects and advantages of the present invention will become more

apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is a view showing the construction of a building management system according to one exemplary embodiment of the present invention;

[0013] FIG. 2 is a flow chart illustrating the process of a method for controlling an operation of the building management system according to one exemplary embodiment of the present invention;

[0014] FIG. 3 is a view showing the construction of a building management system according to another exemplary embodiment of the present invention;

[0015] FIG. 4 is a flow chart illustrating the process of controlling a door in the method for controlling the operation of the building management system according to another exemplary embodiment of the present invention;

[0016] FIG. 5 is a flow chart illustrating the process of controlling an air-conditioner in the method for controlling the operation of the building management system according to the exemplary embodiment of the present invention; and

[0017] FIG. 6 is a view showing operation patterns of various air-conditioners stored in a database in FIG. 3.

DETAILED DESCRIPTION OF THE INVENTION

[0018] The building management system and its operation control method according to the exemplary embodiment of the present invention will now be described with reference to the accompanying drawings.

[0019] FIG. 1 is a view showing the construction of a building management system according to an exemplary embodiment of the present invention.

[0020] As shown in FIG. 1, the building management system includes: multiple systems 301~30N that can be separately operated; a central control unit 100 that communicates with the multiple systems 301~30N, selects at least one system related to state information transmitted from an arbitrary system among the multiple systems 301~30N, based on the state information transmitted from the arbitrary system, generates a control signal corresponding to the state information, and controls an operation of the at least one selected system based on the state information; and a database 200 that previously stores the control information corresponding to the state information.

[0021] The multiple systems 301~30N may include one or more of a ventilation system, an entry management system, a system that detects whether a room is occupied, an automated (unmanned) system, a lighting system, a car parking management system, a door management system, and an air-conditioner system, etc.

[0022] The central control unit 100 analyzes state information of each system transmitted from the multiple systems 301~30N, and controls an operation of an arbitrary system corresponding to the state information according to a previously stored control information corresponding to the state information. Here, the arbitrary system may be one or more of the multiple systems 301~30N.

[0023] The central control unit 100 generates the corresponding control signal based on conditions previously set by the user as stored in the database 200 and the state information

provided from the multiple systems 301~30N, and controls the operation of the arbitrary system according to the control signal.

[0024] The database 200 stores the control information corresponding to the state information according to the state information of each of the multiple systems 301~30N, and the stored control information can be used to control the multiple systems 301~30N in an associated (or cooperating, inter-working, etc.) manner.

[0025] The database 200 stores conditions previously set by the user such as a state in which a door is open for more than 10 seconds or a state in which no person is detected in a room for more than 10 minutes, and the like.

[0026] For example, the central control unit 100 receives the state information from the multiple systems 301~30N. Here, for example, the state information may be information indicating a state that the door is open. When the door-opened state is maintained by more than time previously set by the user, the central control unit 100 generates a signal for controlling an operation of a door opening/closing system or an air-conditioner system, and controls the operation of the door opening/closing system or the air-conditioner system according to the generated signal.

[0027] FIG. 2 is a flow chart illustrating the process of a method for controlling an operation of the building management system according to one exemplary embodiment of the present invention.

[0028] First, the central control unit 100 receives state information from an arbitrary system among the multiple systems 301~30N. The received state information is stored in the database 200 (SP11).

[0029] Thereafter, based on the stored state information, the central control unit 100 selects at least one system related to the state information from the multiple systems, generates a control signal corresponding to the state information stored in the database 200 based on the stored state information, and transmits the control signal to the at least one system based on the state information (SP12).

[0030] Upon receiving the control signal, the at least one selected system performs an operation corresponding to the received control signal with priority over other control signals (SP13).

[0031] FIG. 3 is a view showing the construction of a building management system according to another exemplary embodiment of the present invention.

[0032] As shown in FIG. 3, the building management system according to the exemplary embodiment of the present invention includes a central control unit 100, a database 200, and a door control unit 400.

[0033] The door control unit 400 detects an opened state of a door, generates door state information based on a communication protocol according to the detection result, and transmits the door state information to the central control unit 100.

[0034] The central control unit 100 analyzes the door state information transmitted from the door control unit 400 and controls an operation of an air-conditioner according to the analysis result.

[0035] In a different embodiment of the present invention, the central control unit 100 may control the operation of the air-conditioner based on door state information transmitted from the door control unit 400 and various air-conditioner operation patterns according to conditions previously set by the user.

[0036] The database 200 previously stores operations patterns of the air-conditioner which correspond to the various conditions previously set by the user.

[0037] In addition, the database 200 also stores state information of each system (the door management system, the ventilation system, the lighting system, a temperature management system, and the like).

[0038] The operation of the building management system according to the exemplary embodiment of the present invention will now be described with reference to the accompanying drawings.

[0039] First, the central control unit 100 and the door control unit 400 may be connected according to an RS-485 communication method, which is the communication protocol standard capable of establishing a long distance network. In addition, the central control unit 100 and the door control unit 400 may be also connected according to a different wired/wireless communication method.

[0040] In this state, the door control unit 400 detects opening of the door, generates the door state information based on the communication protocol according to the detection result, and transmits the door state information to the central control unit 100.

[0041] Upon receiving the door state information from the door control unit 400, the central control unit 100 analyzes the information, and controls the operation of the air-conditioner or opening and closing of the door according to the analysis result.

[0042] Here, the operation of opening and closing the door according to the exemplary embodiment of the present invention will now be described with reference to FIG. 4.

[0043] First, the door control unit 400 monitors whether at least one door is opened or closed. Namely, the door control unit 400 detects whether an arbitrary door is opened, and when the corresponding door is opened, the door control unit 400 transmits corresponding door state information to the central control unit 100 (SP21).

[0044] Next, the central control unit 100 checks whether the corresponding door has been opened by more than ascertained time (e.g., more than 10 seconds) according to the door state information (SP22). Upon checking, if the arbitrary door has been opened by more than 10 seconds, the central control unit 100 checks whether the air-conditioner is being operated (SP23). Upon checking, when the air-conditioner is being operated, the central control unit 100 closes the corresponding door (SP24).

[0045] If, however, the air-conditioner is not operated upon checking whether the air-conditioner is operated or not, the process returns to the step SP21 of monitoring whether at least one door is opened or closed without controlling the corresponding door or the air-conditioner.

[0046] Controlling of the operation of the air-conditioner will now be described with reference to FIG. 5.

[0047] First, the door control unit 400 monitors whether at least one door is opened or closed. Namely, the door control unit 400 detects whether an arbitrary door is opened, and when a corresponding door is opened, the door control unit 400 transmits corresponding door state information to the central control unit 100 (SP31).

[0048] Next, the central control unit 100 checks whether there is a person in a room based on whether the arbitrary door is opened or not and whether a lighting system has been turned on or not (SP32).

[0049] For example, when the door is opened, the central control unit **100** checks whether there is a person in the room according to a previous state. Namely, when the door is opened with a person in the room, the central control unit **100** recognizes that the person in the room goes out of the room. When the door is opened with no person in the room, the central control unit **100** recognizes that a person goes into the room.

[0050] In addition, when a certain room is in a turned-on state by the lighting control system, the central control unit recognizes that there is a person in the certain room.

[0051] If there is no person in the room, the central control unit **100** stops an operation of an air-conditioner of the corresponding room (SP33).

[0052] If, however, there is a person in the room, the central control unit **100** returns to the step SP31 of monitoring whether at least one door is opened or closed without controlling the corresponding door management system, the lighting system and the air-conditioner.

[0053] A different embodiment of the present invention will now be described with reference to FIG. 6.

[0054] First, various air-conditioner operation patterns set by the user as shown in FIG. 6 are previously stored in the database **200**.

[0055] In this state, the central control unit **100** checks whether the state information received from the multiple systems meet the pre-set conditions. When the set conditions are met, the central control unit **100** controls the air-conditioner according to an air-conditioner operation pattern corresponding to the set conditions as met.

[0056] For example, the central control unit **100** may control the operation of the air-conditioner according to operation patterns of the air-conditioner set to be operated at a particular time, control the operation of the air-conditioner according to a pre-set operation pattern of the air-conditioner (e.g., the air-conditioner is turned off when the door is open for more than 10 seconds), generate door close control information based on state information of the door and state information of the air-conditioner and apply the door close control information to the door control unit **400**, or generate the door close information and apply the corresponding information to the door control unit **400** when the air-conditioner is being operated in a state that the door has been opened for more than 10 seconds, and so on.

[0057] Besides the conditions set by the user, various other conditions can be added in operating the multiple systems in an interworking manner.

[0058] As so far described, the building management system according to the present invention has the following advantages.

[0059] That is, because the multiple systems can be controlling in an interworking manner based on state information of the multiple systems, a building having the multiple system can be effectively controlled.

[0060] Namely, whether or not the door or a room is opened or close is recognized while the air-conditioner performing an air cooling operation or air heating operation, and when the door is open for more than a certain time, the door of the room is closed according to whether the air-conditioner is operated or not, thereby preventing a waste of energy.

[0061] In addition, whether or not a person is in a room can be detected, and if there is no person in the room, the opera-

tion of the air-conditioner is stopped, thereby preventing a waste of energy according to an unnecessary operation of the air-conditioner.

[0062] As the present invention may be embodied in several forms without departing from the characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalents of such metes and bounds are therefore intended to be embraced by the appended claims.

What is claimed is:

1. A building management system comprising:

a central control unit that receives state information from a first system of a building and controls an operation of a second system of the building based on the state information.

2. A building management system according to claim 1, wherein the first system and the second system comprise one of a ventilation system, an entry management system, a system that detects whether a room is occupied, an automated system, a lighting system, a car parking management system, a door management system, and an air-conditioning system.

3. A building management system according to claim 1, further comprising a database that stores control information corresponding to state information of the first system.

4. A building management system according to claim 3, wherein the central control unit controls the operation of the second system in accordance with the control information stored in the database.

5. A building management system according to claim 1, wherein the central control unit receives state information comprising information on a state of a door and information on a state of an air-conditioning system, and controls an operation of one of a door management system and an air-conditioning system based on the state information.

6. A building management system according to claim 5, wherein the state information indicates that a door is open and the air-conditioning system is operating.

7. A building management system according to claim 5, wherein the central control unit controls the door to close, or stops operation of the air-conditioning system, based on the state information.

8. A building management system according to claim 7, wherein the state information indicates a length of time the door has been open, and the central control unit controls the door or the air-conditioning system based upon the length of time the door has been open.

9. A building management system according to claim 1, wherein the state information indicates whether a person has entered the building and/or a room of the building, and the central control unit controls an operation of an air-conditioning system and/or a lighting system based on the state information.

10. A building management system according to claim 9, wherein the central control unit receives the state information from an entry management system and/or a car parking management system.

11. A method of controlling a system of a building, comprising:
receiving state information from a first system of the building; and

controlling an operation of a second system of the building based on the state information.

12. A method according to claim **11**, wherein the first system and the second system comprise one of a ventilation system, an entry management system, a system that detects whether a room is occupied, an automated system, a lighting system, a car parking management system, a door management system, and an air-conditioning system.

13. A method according to claim **11**, wherein the operation of the second system is controlled in accordance with control information stored in a database corresponding to state information of the first system.

14. A method according to claim **11**, wherein receiving the state information comprises receiving information on a state of a door and information on a state of an air-conditioning system, and controlling the operation of the second system comprises controlling an operation of one of a door management system and an air-conditioning system based on the state information.

15. A method according to claim **14**, wherein the state information indicates that a door is open and the air-conditioning system is operating.

16. A method according to claim **14**, wherein controlling the operation of the second system comprises controlling the door to close, or stopping operation of the air-conditioning system, based on the state information.

17. A method according to claim **16**, wherein the state information indicates a length of time the door has been open, and controlling the operation of the second system comprises controlling the door or the air-conditioning system based upon the length of time the door has been open.

18. A method according to claim **11**, wherein the state information indicates whether a person has entered the building and/or a room of the building, and controlling the operation of the second system comprises controlling an operation of an air-conditioning system and/or a lighting system based on the state information.

19. A method according to claim **18**, wherein the state information is received from an entry management system and/or a car parking management system.

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